

**128K x 8 Static RAM**

**Features**

- High speed
  - $t_{AA} = 12, 15 \text{ ns}$
- CMOS for optimum speed/power
- Center power/ground pinout
- Automatic power-down when deselected
- Easy memory expansion with  $\overline{CE}$  and  $\overline{OE}$  options
- Functionally equivalent to CY7C1019

**Functional Description**

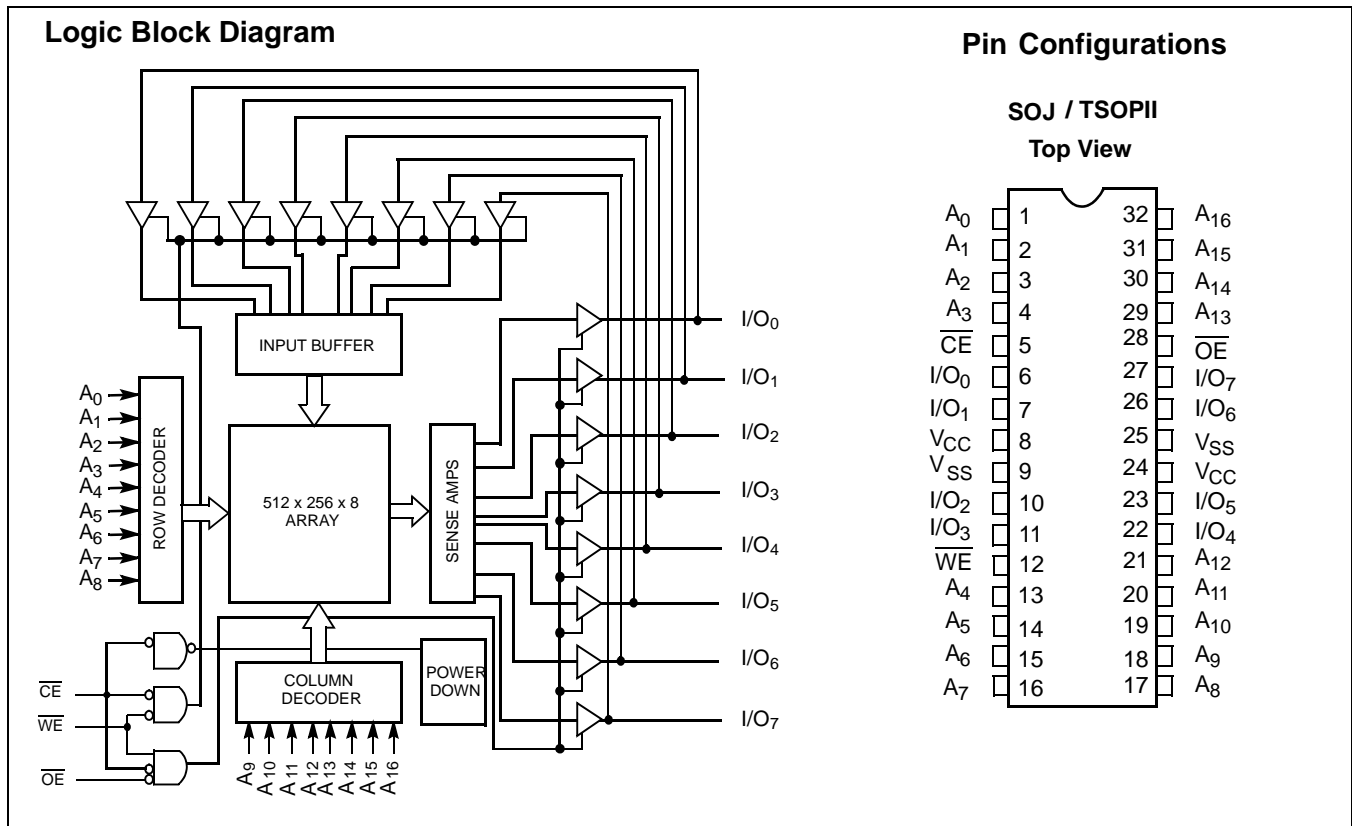
The CY7C1019BN is a high-performance CMOS static RAM organized as 131,072 words by 8 bits. Easy memory expansion is provided by an active LOW Chip Enable ( $\overline{CE}$ ), an active LOW Output Enable ( $\overline{OE}$ ), and three-state drivers. This device has an automatic power-down feature that significantly reduces power consumption when deselected.

Writing to the device is accomplished by taking Chip Enable ( $\overline{CE}$ ) and Write Enable ( $\overline{WE}$ ) inputs LOW. Data on the eight I/O pins ( $I/O_0$  through  $I/O_7$ ) is then written into the location specified on the address pins ( $A_0$  through  $A_{16}$ ).

Reading from the device is accomplished by taking Chip Enable ( $\overline{CE}$ ) and Output Enable ( $\overline{OE}$ ) LOW while forcing Write Enable ( $\overline{WE}$ ) HIGH. Under these conditions, the contents of the memory location specified by the address pins will appear on the I/O pins.

The eight input/output pins ( $I/O_0$  through  $I/O_7$ ) are placed in a high-impedance state when the device is deselected ( $\overline{CE}$  HIGH), the outputs are disabled ( $\overline{OE}$  HIGH), or during a write operation ( $\overline{CE}$  LOW, and  $\overline{WE}$  LOW).

The CY7C1019BN is available in standard 32-pin TSOP Type II and 400-mil-wide SOJ packages.



**Selection Guide**

		7C1019BN-12	7C1019BN-15	Unit
Maximum Access Time		12	15	ns
Maximum Operating Current		140	130	mA
Maximum Standby Current		10	10	mA
	L	1	1	mA

**Maximum Ratings**

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature ..... -65°C to +150°C

Ambient Temperature with Power Applied..... -55°C to +125°C

Supply Voltage on  $V_{CC}$  to Relative GND<sup>[1]</sup> .... -0.5V to +7.0V

DC Voltage Applied to Outputs in High Z State<sup>[1]</sup> ..... -0.5V to  $V_{CC} + 0.5V$

DC Input Voltage<sup>[1]</sup>..... -0.5V to  $V_{CC} + 0.5V$

Current into Outputs (LOW)..... 20 mA

Static Discharge Voltage..... >2001V (per MIL-STD-883, Method 3015)

Latch-Up Current..... >200 mA

**Operating Range**

Range	Ambient Temperature <sup>[2]</sup>	$V_{CC}$
Commercial	0°C to +70°C	5V ± 10%
Industrial	-40°C to +85°C	5V ± 10%

**Electrical Characteristics** Over the Operating Range

Parameter	Description	Test Conditions	-12		-15		Unit
			Min.	Max.	Min.	Max.	
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}, I_{OH} = -4.0 \text{ mA}$	2.4		2.4		V
$V_{OL}$	Output LOW Voltage	$V_{CC} = \text{Min.}, I_{OL} = 8.0 \text{ mA}$		0.4		0.4	V
$V_{IH}$	Input HIGH Voltage		2.2	$V_{CC} + 0.3$	2.2	$V_{CC} + 0.3$	V
$V_{IL}$	Input LOW Voltage <sup>[1]</sup>		-0.3	0.8	-0.3	0.8	V
$I_{IX}$	Input Leakage Current	$GND \leq V_I \leq V_{CC}$	-1	+1	-1	+1	µA
$I_{OZ}$	Output Leakage Current	$GND \leq V_I \leq V_{CC}$ , Output Disabled	-5	+5	-5	+5	µA
$I_{CC}$	$V_{CC}$ Operating Supply Current	$V_{CC} = \text{Max.}, I_{OUT} = 0 \text{ mA}, f = f_{MAX} = 1/t_{RC}$		140		130	mA
$I_{SB1}$	Automatic CE Power-Down Current —TTL Inputs	Max. $V_{CC}$ , $\overline{CE} \geq V_{IH}$ $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}, f = f_{MAX}$		40		40	mA
			L	20		20	
$I_{SB2}$	Automatic CE Power-Down Current —CMOS Inputs	Max. $V_{CC}$ , $\overline{CE} \geq V_{CC} - 0.3V$ , $V_{IN} \geq V_{CC} - 0.3V$ , or $V_{IN} \leq 0.3V, f = 0$		10		10	mA
			L	1		1	

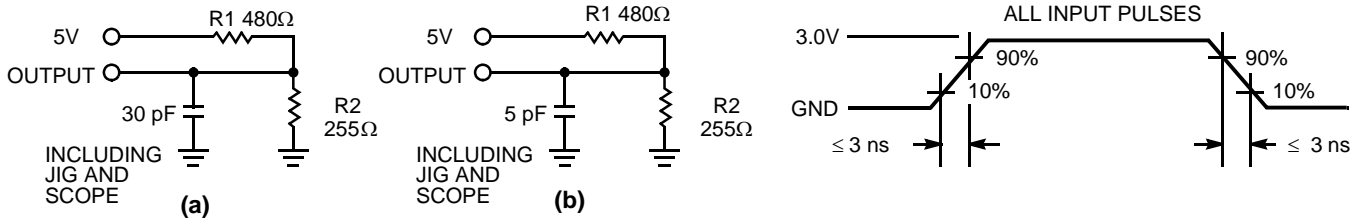
**Capacitance<sup>[3]</sup>**

Parameter	Description	Test Conditions	Max.	Unit
$C_{IN}$	Input Capacitance	$T_A = 25^\circ\text{C}, f = 1 \text{ MHz}, V_{CC} = 5.0V$	6	pF
$C_{OUT}$	Output Capacitance		8	pF

**Notes:**

- $V_{IL}$  (min.) = -2.0V for pulse durations of less than 20 ns.
- $T_A$  is the "Instant On" case temperature.
- Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms



Equivalent to: THÉVENIN EQUIVALENT  
 OUTPUT ○ — 167Ω — 1.73V

Switching Characteristics<sup>[4]</sup> Over the Operating Range

Parameter	Description	-12		-15		Unit
		Min.	Max.	Min.	Max.	
<b>Read Cycle</b>						
t <sub>RC</sub>	Read Cycle Time	12		15		ns
t <sub>AA</sub>	Address to Data Valid		12		15	ns
t <sub>OHA</sub>	Data Hold from Address Change	3		3		ns
t <sub>ACE</sub>	$\overline{CE}$ LOW to Data Valid		12		15	ns
t <sub>DOE</sub>	$\overline{OE}$ LOW to Data Valid		6		7	ns
t <sub>LZOE</sub>	$\overline{OE}$ LOW to Low Z	0		0		ns
t <sub>HZOE</sub>	$\overline{OE}$ HIGH to High Z <sup>[5, 6]</sup>		6		7	ns
t <sub>LZCE</sub>	$\overline{CE}$ LOW to Low Z <sup>[6]</sup>	3		3		ns
t <sub>HZCE</sub>	$\overline{CE}$ HIGH to High Z <sup>[5, 6]</sup>		6		7	ns
t <sub>PU</sub>	$\overline{CE}$ LOW to Power-Up	0		0		ns
t <sub>PD</sub>	$\overline{CE}$ HIGH to Power-Down		12		15	ns
<b>Write Cycle<sup>[7, 8]</sup></b>						
t <sub>WC</sub>	Write Cycle Time	12		15		ns
t <sub>SCE</sub>	$\overline{CE}$ LOW to Write End	9		10		ns
t <sub>AW</sub>	Address Set-Up to Write End	8		10		ns
t <sub>HA</sub>	Address Hold from Write End	0		0		ns
t <sub>SA</sub>	Address Set-Up to Write Start	0		0		ns
t <sub>PWE</sub>	$\overline{WE}$ Pulse Width	8		10		ns
t <sub>SD</sub>	Data Set-Up to Write End	6		8		ns
t <sub>HD</sub>	Data Hold from Write End	0		0		ns
t <sub>LZWE</sub>	$\overline{WE}$ HIGH to Low Z <sup>[6]</sup>	3		3		ns
t <sub>HZWE</sub>	$\overline{WE}$ LOW to High Z <sup>[5, 6]</sup>		6		7	ns

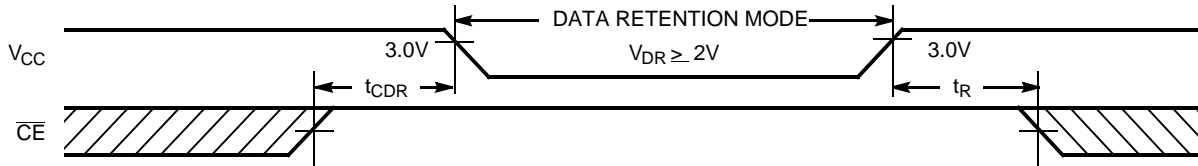
Notes:

- Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I<sub>OL</sub>/I<sub>OH</sub> and 30-pF load capacitance.
- t<sub>HZOE</sub>, t<sub>HZCE</sub>, and t<sub>HZWE</sub> are specified with a load capacitance of 5 pF as in part (b) of AC Test Loads. Transition is measured ±500 mV from steady-state voltage.
- At any given temperature and voltage condition, t<sub>HZCE</sub> is less than t<sub>LZCE</sub>, t<sub>HZOE</sub> is less than t<sub>LZOE</sub>, and t<sub>HZWE</sub> is less than t<sub>LZWE</sub> for any given device.
- The internal write time of the memory is defined by the overlap of CE LOW and WE LOW. CE and WE must be LOW to initiate a write, and the transition of any of these signals can terminate the write. The input data set-up and hold timing should be referenced to the leading edge of the signal that terminates the write.
- The minimum write cycle time for Write Cycle no. 3 (WE controlled, OE LOW) is the sum of t<sub>HZWE</sub> and t<sub>SD</sub>.

**Data Retention Characteristics** Over the Operating Range (L Version Only)

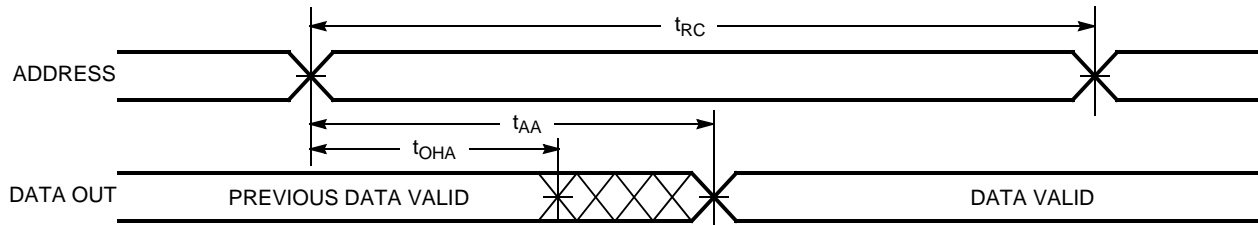
Parameter	Description	Conditions	Min.	Max.	Unit
$V_{DR}$	$V_{CC}$ for Data Retention	No input may exceed $V_{CC} + 0.5V$ $V_{CC} = V_{DR} = 2.0V$ , $\overline{CE} \geq V_{CC} - 0.3V$ , $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$	2.0		V
$I_{CCDR}$	Data Retention Current			300	$\mu A$
$t_{CDR}^{[3]}$	Chip Deselect to Data Retention Time		0		ns
$t_R$	Operation Recovery Time		200		$\mu s$

**Data Retention Waveform**

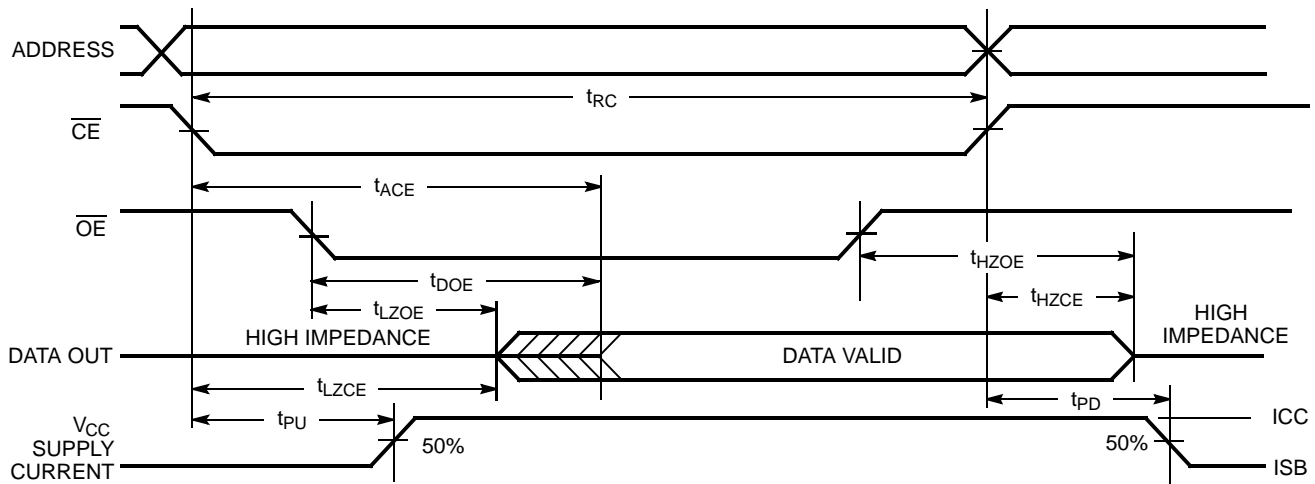


**Switching Waveforms**

**Read Cycle No. 1** <sup>[9, 10]</sup>



**Read Cycle No. 2 ( $\overline{OE}$  Controlled)** <sup>[10, 11]</sup>

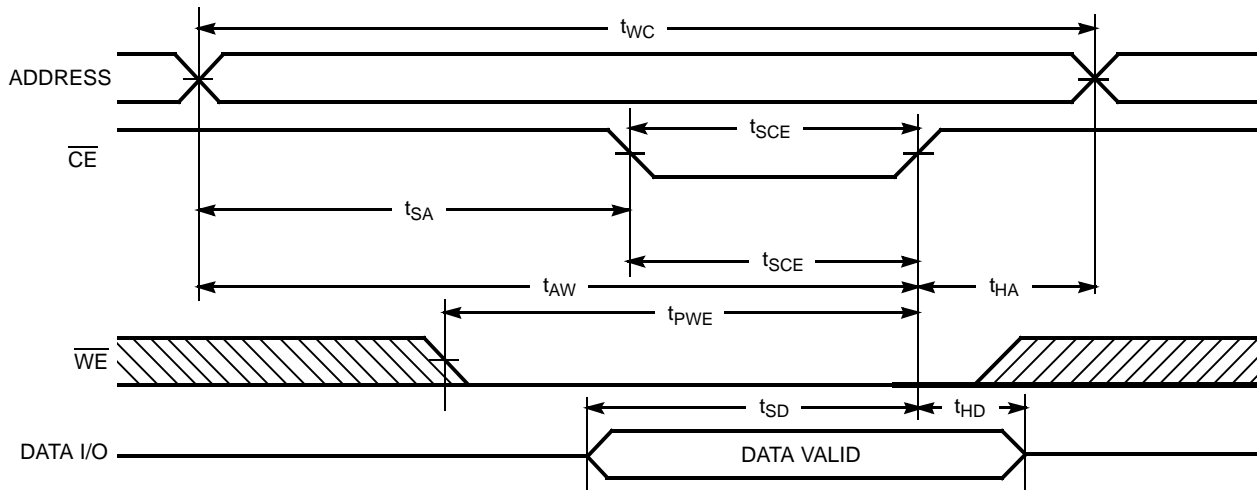


**Notes:**

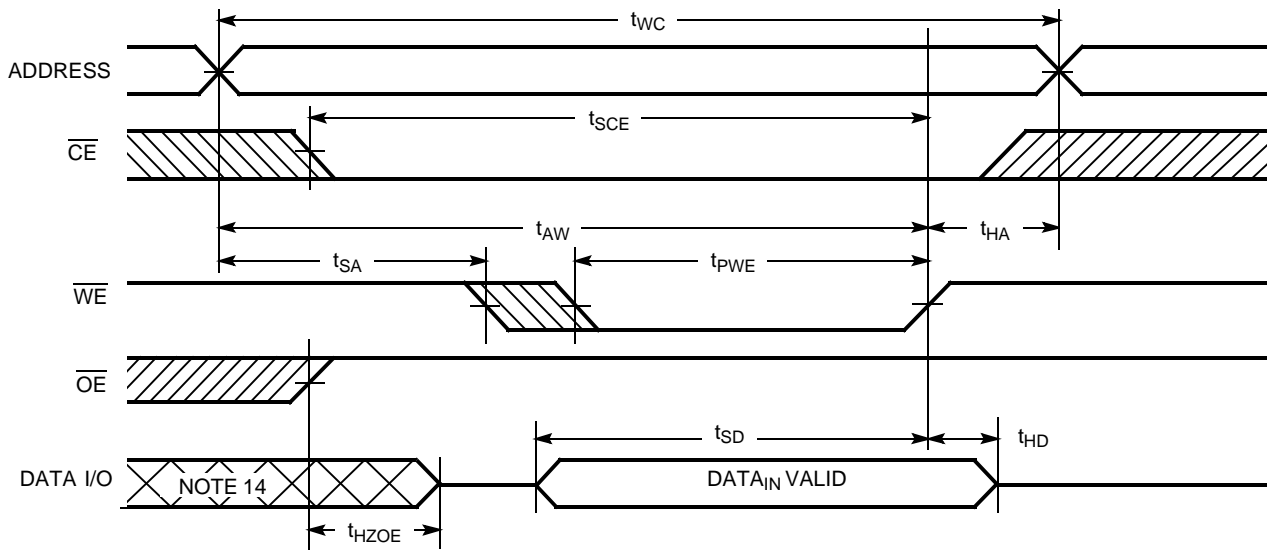
- 9. Device is continuously selected.  $\overline{OE}$ ,  $\overline{CE} = V_{IL}$ .
- 10. WE is HIGH for read cycle.
- 11. Address valid prior to or coincident with  $\overline{CE}$  transition LOW.

Switching Waveforms (continued)

Write Cycle No. 1 ( $\overline{CE}$  Controlled)<sup>[12, 13]</sup>



Write Cycle No. 2 ( $\overline{WE}$  Controlled,  $\overline{OE}$  HIGH During Write)<sup>[12, 13]</sup>

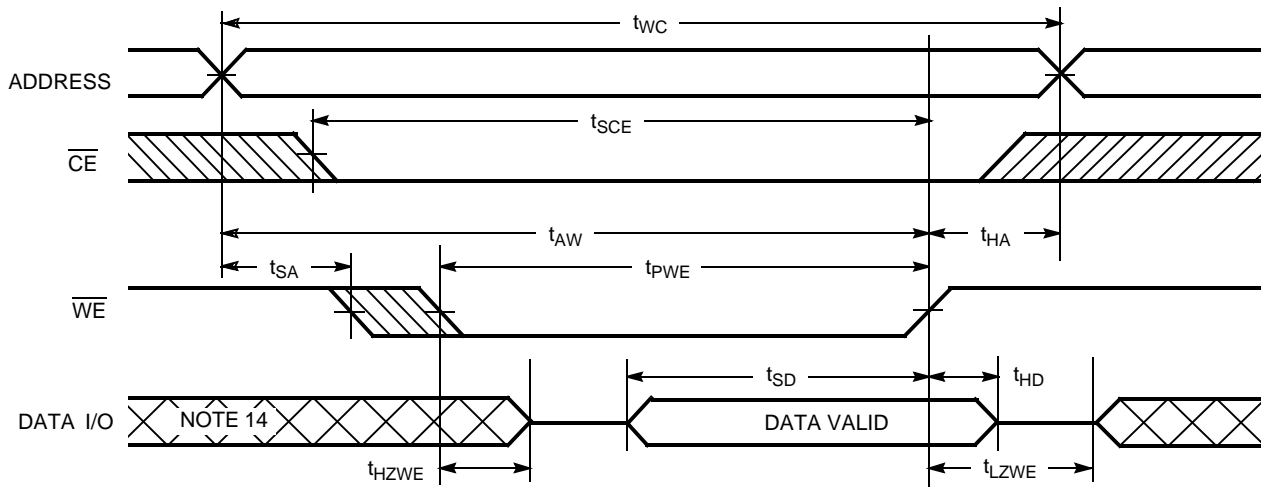


Notes:

- 12. Data I/O is high impedance if  $\overline{OE} = V_{IH}$ .
- 13. If  $\overline{CE}$  goes HIGH simultaneously with  $\overline{WE}$  going HIGH, the output remains in a high-impedance state.
- 14. During this period the I/Os are in the output state and input signals should not be applied.

Switching Waveforms (continued)

Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW)<sup>[13]</sup>



Truth Table

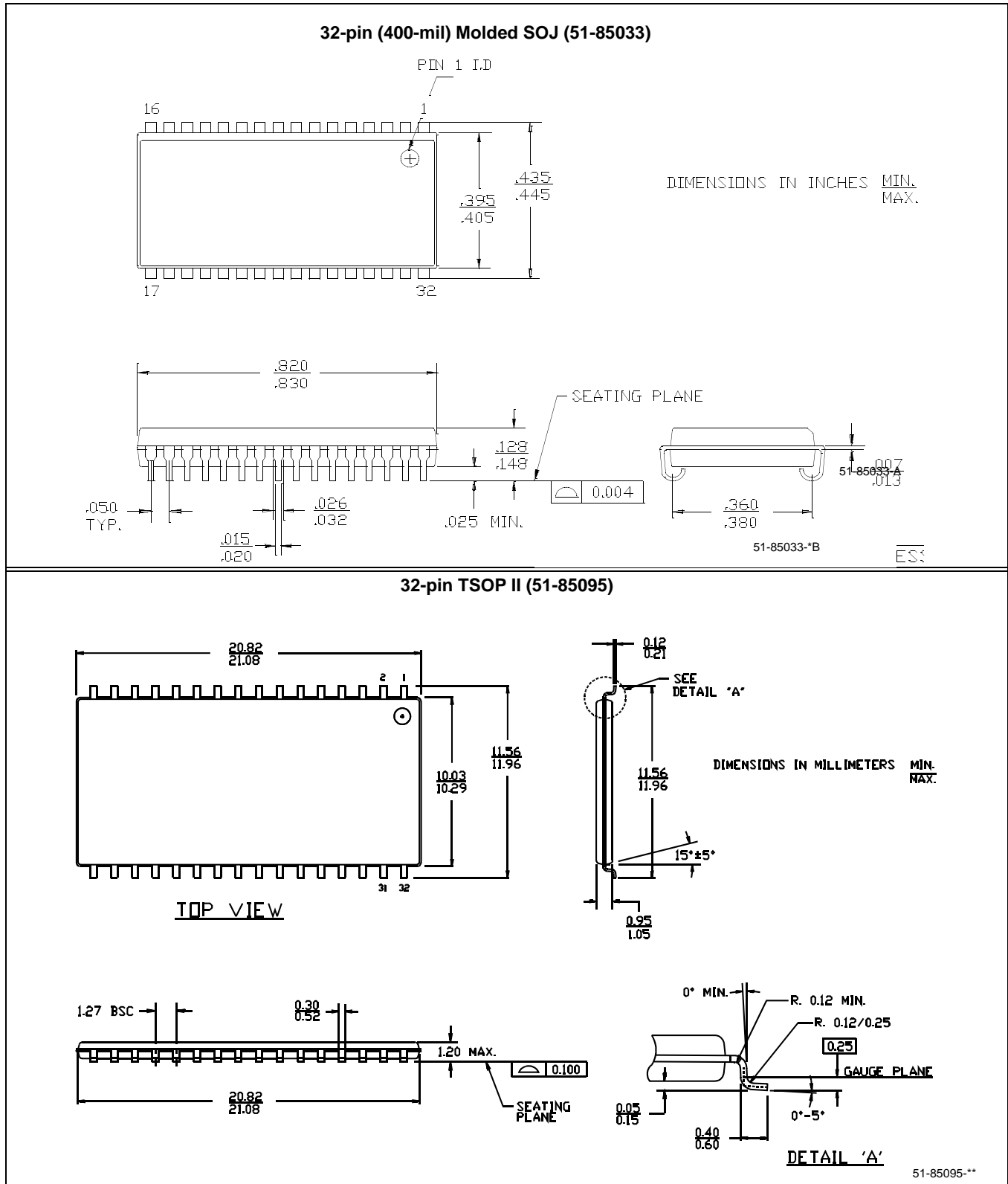
$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	I/O <sub>0</sub> -I/O <sub>7</sub>	Mode	Power
H	X	X	High Z	Power-Down	Standby (I <sub>SB</sub> )
L	L	H	Data Out	Read	Active (I <sub>CC</sub> )
L	X	L	Data In	Write	Active (I <sub>CC</sub> )
L	H	H	High Z	Selected, Outputs Disabled	Active (I <sub>CC</sub> )

Ordering Information

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
12	CY7C1019BN-12VC	51-85033	32-Lead 400-Mil Molded SOJ	Commercial
	CY7C1019BN-12ZC	51-85095	32-Lead TSOP Type II	
	CY7C1019BN-12ZXC	51-85095	32-Lead TSOP Type II (Pb-free)	
15	CY7C1019BN-15VC	51-85033	32-Lead 400-Mil Molded SOJ	Commercial
	CY7C1019BN-15ZXC	51-85095	32-Lead TSOP Type II (Pb-free)	

Please contact local sales representative regarding availability of these parts

Package Diagrams



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**Document History Page**

<b>Document Title: CY7C1019BN 128K x 8 Static RAM</b> <b>Document Number: 001-06425</b>				
<b>REV.</b>	<b>ECN NO.</b>	<b>Issue Date</b>	<b>Orig. of Change</b>	<b>Description of Change</b>
**	423847	See ECN	NXR	New Data Sheet